LIVERMORE LAB
REPORT

A weekly review of scientific and technological achievements from Lawrence Livermore National Laboratory, Nov. 7-11, 2011.

The Washington Post

SOLVING A NUCLEAR MYSTERY

The Dawn supercomputer (IBM BlueGene P) in the Terascale Simulation Facility at Lawrence Livermore National Laboratory.

Laboratory scientists conduct what-if scenarios quite often using supercomputers to simulate what happens to a nuclear weapon -- from the moment it leaves storage to the point when it hits a target.

The nuclear researchers examine how temperature, altitude, vibration and other factors would affect the bomb in what is called the stockpile-to-target sequence.

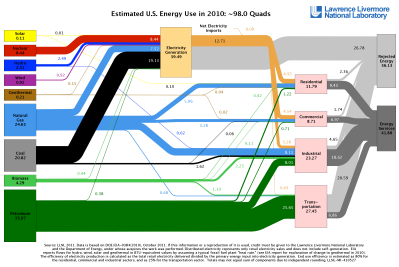
Instead of the usual method of examining data from earlier nuclear explosive tests and taking warheads apart, this time, the scientists and designers relied entirely on supercomputer modeling, running huge amounts of code.

Then came a surprise. The computer simulations showed that at a certain point from stockpile to target, the weapon would "fail catastrophically," according to Bruce Goodwin, principal associate director at Livermore for weapons programs. Such a failure would mean that the weapon would not produce the explosive yield expected by the military — either none at all, or something quite different than required to properly hit the target.

To read more, go to *The Washington Post*.

SAN FRANCISCO Business Times

RUNNING ON DINOSAUR POWER



After hitting a 12-year low in 2009, American energy use went back up in 2010, particularly the use of fossil fuels such as coal, natural gas and petroleum.

A report from the Laboratory said renewable energy use remained at a flat level from 2009 to 2010. Though Americans got more energy from wind power, that growth was offset by a drop in hydroelectric generation.

The United States used 98 quadrillion "quads" BTUs (British Thermal Units) of energy in 2010, the Lab said, up from 94.6 "quads" in 2009.

To understand where wind power fits in that picture, U.S. generation by wind was 0.92 quads in 2010. That works out to less than 1 percent of total U.S. energy used that year.

To read more, go to the *San Francisco Business Times*.

SAN FRANCISCO Chronicle

SCIENCE FUNFARE

More than 21,000 people crowded into AT&T Park recently for a day of hands-on experiments, exhibits, games and shows during Science Discovery Day at AT&T Park. The event was the culmination of the Bay Area Science Festival's weeklong science festivities, which featured more than 100 fun, interactive science and technology events.

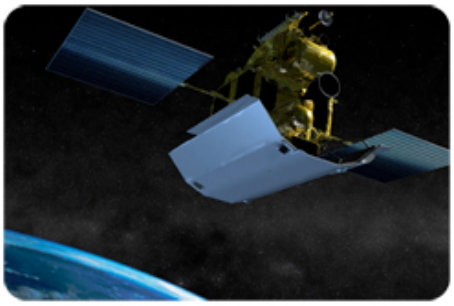
LLNL joined more than 170 exhibitors to bring science to the masses. Situated along the third base line, the Lab booth was in prime position to welcome visitors and drew a constant crowd. Science enthusiasts, young and old, flocked to the LLNL tents to view a 3D video from the National Ignition Facility, test their knowledge with a Science Challenge Game and experiment with solving the energy crisis via interactive electronic climate simulation.

Throughout the day, volunteers drew constant crowds with the Lab's popular "Fun With Science" presentation, translating topics like air pressure, chemical reactions and electricity into interactive experiments such as "Elephant Toothpaste," "Marshmallow Man" and "Leaky Bottle."

For more information and photos, go to the *San Francisco Chronicle*.

SCIENCE TODAY at the University of California

A MESSENGER TO MERCURY



Artist's depiction of MESSENGER Departing Earth, courtesy of NASA/Johns Hopkins University Applied Physics Laboratory/Carnegie Institution of Washington

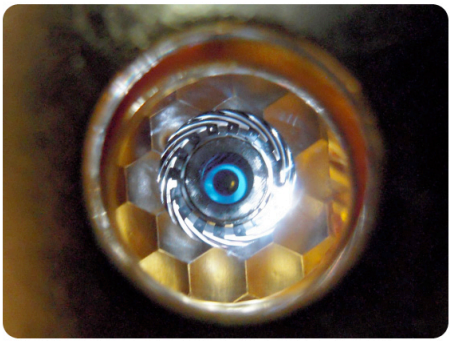
Since March, NASA's Mercury Messenger has been orbiting Mercury, becoming the first spacecraft to circle the planet. Onboard to get data of the planet's composition is the first mechanically cooled gamma ray spectrometer in deep space. Lab physicist Morgan Burks was part of the team that built the instrument.

"This system is cooled with a device — think of it as a very tiny refrigerator that can fit in the palm of your hand — and it's able to cool the detector to about minus 200 degrees Celsius," Burks said. "And at those temperatures is where we get the really high resolution. It's like the difference between a blurry fingerprint and a sharp fingerprint."

Burks is part of the science team that's monitoring the instrument's performance and says so far it's been excellent.

To hear the interview, go to *Science Today*.

MISSOURI S&T THROUGH THE LOOKING GLASS



Laser's-eye view of a NIF Target

The Laboratory has granted Missouri University of Science and Technology researchers $125,000 to produce a special glass panel that blocks infrared light while allowing ultra-violet light to pass through.

The glass will be used so that the light from the 192 lasers within the National Ignition Facility can be converted from infrared light to ultra-violet light before hitting the target.

Unconverted infrared light can damage the target and the sensors used to study the fusion process. That's why a new type of "blue" glass is being developed.

In California, the laser pulses pass through two crystal panels that convert the "red" light to "blue." But some of the undesired light still gets through. Hence, the need for a third filter -- the glass panel transmits the desired ultra-violet light directly to the target, blocking the undesired wavelengths.

NIF's fusion experiments are scheduled to begin in 2012.

LLNL applies and advances science and technology to help ensure national security and global stability. Through multi-disciplinary research and development, with particular expertise in high-energy-density physics, laser science, high-performance computing and science/engineering at the nanometer/subpicosecond scale, LLNL innovations improve security, meet energy and environmental needs and strengthen U.S. economic competitiveness. The Laboratory also partners with other research institutions, universities and industry to bring the full weight of the nation's science and technology community to bear on solving problems of national importance.

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